

Individuals' opinion on agricultural multifunctionality

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Abstract

This paper aims to contribute further research on the conceptualization of agricultural multifunctionality through quantitative methods. The empirical analysis is based on a large dataset (Agrobarometre of Andalusia) consisting of self-reported measures of individual opinions on multifunctionality. Ordered probit models are proposed to analyze the extent to which individuals' perceptions of multifunctionality can be explained not only by individual and regional characteristics, but more importantly, by the preferences individuals have for a given type of agriculture. Results indicate that individuals are aware of the multi-dimensional nature of agriculture as a provider of private and public goods and services, although a big fraction of the population still focuses its demand on private goods production. It is not surprising that individuals' perceptions about the multifunctionality concept are site-specific, depending on the surrounding farming systems. Given their stated preference for a type of agricultural multifunctionality, the proposed quantitative method highlights those attributes of the concept which do not fully satisfy individuals' expectations. Overall, this manuscript provides a useful empirical tool for policy-makers concerned with improving satisfaction on the perception of multifunctionality in the agricultural sector.

Additional key words: agricultural policies, attitudes and perceptions, ordered probit, regional differences.

Resumen

Opinión de los ciudadanos sobre la multifuncionalidad agraria

El objetivo del presente trabajo es contribuir a la investigación sobre el concepto de multifuncionalidad de la agricultura, a partir de técnicas cuantitativas. Esto es posible gracias a una gran encuesta de opinión (Agrobarómetro de Andalucía) que contiene datos relativos a la opinión individual sobre la multifuncionalidad agraria. A partir de la estimación de modelos probit ordenados se puede analizar en qué medida la percepción individual de la multifuncionalidad agraria puede explicarse, no sólo a partir de características individuales y regionales, sino también a partir de las preferencias individuales por un tipo de agricultura dado. De los resultados obtenidos se destaca cómo los individuos son conscientes del carácter multi-dimensional de la agricultura como proveedor de bienes y servicios públicos y privados, si bien existe una demanda generalizada, por parte de la población andaluza, de producción de bienes privados. No resulta sorprendente observar cómo las percepciones individuales sobre el concepto de multifuncionalidad son específicas del lugar de residencia del individuo y del sistema agrario existente. Una vez indicadas las preferencias individuales por un tipo de multifuncionalidad dado, los métodos cuantitativos propuestos subrayan aquellos atributos del concepto que no satisfacen plenamente las expectativas individuales. Estos resultados deberían ser tenidos en cuenta en el debate actual sobre el diseño de la política agraria, al objeto de que su aplicación permita cubrir, en la medida de lo posible, las demandas insatisfechas de la ciudadanía.

Palabras clave adicionales: actitudes y percepciones, diferencias regionales, modelo probit ordenado, política agraria.

Introduction

The future of agriculture and its role in rural areas is a topic of ongoing social, political and scientific debate

in Europe. Greater public concern with the importance of avoiding environmental problems related with farming activities, and the need of maintaining rural communities have probably been the main driving forces in this matter. As a consequence, agriculture is not only considered a provider of food and fibers, but there is also a growing social concern regarding its

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environmental, social and territorial dimensions. Agricultural multifunctionality arises as a future path for European agriculture with emphasis on the production of appropriate market goods and non-market or public goods and services that are increasingly demanded by the public (EC, 2000; OECD, 2001a).

Within this context, individuals are no longer mere consumers of agricultural products, but more and more consciously expect new and better public goods and services from agriculture. This raises the question about the role of individuals' opinions on this ongoing process. Recent research has focused mainly on the relevance and definition of multifunctionality from a theoretical point of view and its use as a policy option. Nevertheless, empirical research of this debate is also important so as to develop instruments that have clear objectives and that target any potential public support to the sector (OECD, 2003).

As an OECD study shows, the vast majority of studies regarding agricultural multifunctionality have focused on the supply (or producer) side (OECD, 2001a). They analyze issues such as the joint production of agricultural outputs, market failures or options for ensuring the provision of public goods and services from multifunctional agriculture. However, it is surprising to note that the multifunctionality debate has rarely stopped to consider the demand (or consumer) side by analysing individual preferences for private and public goods and services, as well as individuals' opinions on the performance of agriculture within this multifunctional framework. The first approach (*the joint valuation of private and public goods and services from agriculture*) is usually taken by economists, trying to establish social utility functions that should be maximized using different policy instruments (Randall, 2002). The second approach (*individuals' satisfaction with the degree of accomplishment of agricultural multifunctionality*) focuses its attention on social dissatisfaction. This latter approach answers questions such as «which individuals are unhappy with the current performance of farming activities?» or «which are the main causes (attributes of agriculture) of such dissatisfaction?» Answers to these questions are highly valued by politicians, willing to discover «bags» of social dissatisfaction where their political proposals could be welcome. Thus, gaining a better understanding on individuals' opinion on agricultural multifunctionality will be of particular relevance to decision and policy-makers as it could help raising awareness about the issues faced in defining «agriculture», and ultimately contribute agriculture policy

development and evaluation at a local, national and international levels.

Therefore, the objective of this paper is to use a large dataset to contribute further insights into the opinion individuals have about the performance of the agricultural sector, taking into account its multi-attribute feature. There are two major contributions to the literature in using the present approach to measure individuals' opinion on multifunctionality. First, the use of large quantitative datasets vs. qualitative methods may have greater significance in terms of using research in policy decisions. The interest of this research lies both in its approach, which emphasizes the need for considering individuals' opinions for public policy evaluation, and its methodology, which can be employed in any geographic area. Second, the importance of each agricultural attribute on overall multifunctionality (as perceived by individuals) and their determinants will provide an opportunity to examine individual and regional characteristics, which affect the multifunctionality concept. More importantly, this will highlight those attributes of the concept which do not fully satisfy individuals' expectations. In doing so, this research will provide a useful empirical tool for policy-makers concerned on improving satisfaction with the multifunctionality of the agricultural sector.

This research was conducted using the *2003 Survey on Individuals' Opinion on Rurality and Agriculture in Andalusia*, hereafter *Agrobarometre 2003* (IESA, 2004). The wide variety of agricultural systems and landscapes of this region make it an appropriate case of study for the purpose of this research. The survey is intended as a snapshot of individuals' preferences for and opinions on different attributes of agriculture, further including individual data on demographic and socio-economic characteristics.

Multifunctional agriculture: a review of issues and concept

During the past few years the concept of agricultural multifunctionality has been extensively used in Europe both in political and academic grounds. This development is, among others, clearly connected to the European Union (EU) declaration in favour of a European multifunctional agriculture in the course of the Council of Ministers of Agriculture and the European Council (EC) in December 1997 (see also EC, 1998, 1999 and

2000). In this context, agriculture must not only produce a wide range of marketable goods and services, but must also respond to its environmental, social and territorial dimensions, *i.e.* maintenance of villages and rural traditions, rural landscapes, good agricultural practices, etc. Thus, the «new» concept of multifunctional agriculture reflects the «ancient» capacity of agriculture to produce different kind of goods and services covering a wide range of society's demands. Some of these goods and services can be sold in existing markets (private goods as food and fibers), while others are supplied without any monetary compensation for farmers (public goods and services as landscape, rural villages viability, etc.) (OECD, 2001a). Mainly as a result of the events that took place in the last decade (*i.e.* globalization, trade liberalization, etc.), politicians and the general public have realized the dangers in the lack of competitiveness and abandonment of agricultural activities in certain areas. Individuals and politicians are becoming more aware of the consequences on social well-being from stopping farming activities in their surrounding areas, which could go far beyond the single break down in the supply of local foods and other raw materials. Thus, in recent years individuals are more conscious of the multidimensional nature of agriculture, as a key characteristic that needs to be taken into account in any agricultural policy reform.

It is worth bearing in mind, however, the emergence of a new countryside which is inextricably linked with a growing literature on the increasing importance of new horizontal multifunctional enterprises and networks developed in rural areas (*i.e.* *multifunctionality of the rural space* –for a reference see Knickel and Renting, 2000; Delgado *et al.*, 2003). In any case, this research will focus only on the earlier definition of agricultural multifunctionality.

Most of the academic work on agricultural multifunctionality has mainly focused on theoretical issues. The purpose has been to define and re-define the concept identifying and analysing specific related issues as joint production of agricultural outputs, market failures, options for ensuring provision of public goods from multifunctional agriculture or the policy implications of this concept (see for example, Anderson, 2000; Cahill, 2001; OECD, 2001a; Paarlberg *et al.*, 2002; Peterson *et al.*, 2002; Vatn, 2002; Batie, 2003; Harvey, 2003; Pretz, 2003; Van Huylenbroeck and Durand,

2003; Brouwer, 2004). However, little attention has been paid to the provision of meaningful quantitative results to support the existing literature. This lack of empirical research that supports the theoretical work has been clearly stated by the OECD (2001a, 2003). The 90th Seminar of the *European Association of Agricultural Economics* celebrated in Rennes in 2005 was entirely dedicated to this issue under the title: «*Multifunctional agriculture, policies and markets: understanding the critical linkage*»¹. The seminar provided an opportunity to review the knowledge concerning the concept itself and to focus on the analysis of supply and demand for private and public goods and services.

Therefore, there is a need to draw lessons from individuals' relevant experiences on agricultural multifunctionality, providing empirical evidence that offers appropriate answers to policy design. Most of the studies undertaken so far have focused on the supply (see OECD, 2001a for a thorough revision) rather than the demand aspects of agricultural multifunctionality. While some authors (see for example: Brunstad *et al.*, 1995; Bonnieux *et al.*, 1998; Lankoski and Ollikainen, 2003; Guyomard *et al.*, 2004) have mostly investigated only supply side and farmers' view on multifunctionality, citizens' preferences towards and opinions on multifunctionality have been rarely considered either in research nor policy planning (see Hall *et al.*, 2004; Yrjölä and Kola, 2004; Hyytiä and Kola, 2005). The small quantity of research that is focused mostly on economic valuation and explicit elicitation of willingness to pay has been done to systematically examine individuals' preferences towards multifunctional agriculture. Within this demand side framework, this current research focuses both on individuals' preferences and opinions of multifunctionality. As already mentioned, results can provide useful information from which policy-makers can draw some conclusions on whether the aims and measures are in line with citizens' views and expectations in their attempt to maximize their social utility.

However, determining individuals' preferences and opinions is really a challenging task. Researchers and policy makers frequently use the term multifunctionality assuming that people have a clear understanding of its meaning. Nevertheless, even in moments of heightened public awareness, establishing consistent preferences for complex goods as agricultural multifunctionality is not straightforward for individuals. In fact, axioms

¹ For further details the web <http://merlin.lusignan.inra.fr:8080/eaee/website> can be visited, where all contributed papers are available.

and rules from economic and psychological theories can provide guidance in this sense but they do not guarantee the identification of stable and consistent preferences. Nonetheless, there is strong evidence implying that answers to subjective questions, like the ones studied here (i.e. preferences and opinions on agricultural multifunctionality) are meaningful, that individuals are able and willing to answer such questions, and that responses are interpersonally comparable (Clark and Oswald, 1994; Clark, 1997; DiTella *et al.*, 2001). It is expected then, that this new understanding can contribute to a better knowledge of society's preferences and opinions dealing with agriculture. Moreover, it will support the design of more accepted and efficient agricultural policies focused on decreasing individuals' dissatisfaction.

In an attempt to disentangle the determinants of individuals' opinions on agricultural multifunctionality, it is logical to assert that these opinions depend not only upon objective socio-economic and demographic variables, but can also significantly differ by region and by the preferences individuals have for a given type of agricultural multifunctionality. To begin with, different agricultural systems, occurring in different regions, play a paramount role in the maintenance of landscapes, the socio-economic viability of the region and other functions (OECD, 2001a). As a result, local differences are likely to exist. For example, rural areas in densely populated parts of Northern Europe are clearly characterized by their urban character. The resulting influence on the agricultural sector is felt strongly through a growing population pressure on the open area, new and more stringent environmental measures and a more strict regulation of spatial planning (Goetgeluk and Schotten, 2000). By controlling for spatial characteristics, it is possible to provide an explanation for regional differences on the perceived success of multifunctional agriculture in that region. Furthermore, it is reasonable to assume that individuals' opinions on multifunctionality will vary along different individuals depending on their initial expectations of the concept (stated preferences of multifunctionality). In this sense, it is expected that conservationists will be more concerned with environmental protection while consumers may focus more on food production. Thus, individuals' opi-

nions on agricultural multifunctionality vary dependent on their stated level of concern with each attribute considered (Boulanger *et al.*, 2004).

In summary, although each individual is free to define his/her own opinion on agricultural multifunctionality, in practice there is a variety of aspects (i.e. determinants) that seem to affect individuals' opinions in the same way. The remainder of the paper is devoted to disentangle and provide further evidence on the effect of these determinants on individuals' opinions on agricultural multifunctionality.

The survey and empirical specification

The case study

Andalusia is an autonomous region in Southern Spain with an extension of 87.5 million km² and a population of 7.6 million people. The region is administratively divided in 8 provinces (Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Sevilla), comprising a wide variety of agricultural systems going from intensive crops production in greenhouses in littoral areas to traditional inland Mediterranean systems of olive groves, cereals and vineyards, and more extensive marginal ones in the mountain areas, mainly devoted to animal production. This wide variety of production systems makes the Andalusia an appropriate case study for the purpose of this research.

The opinion survey

The dataset used in this research is derived from the *Agrobarometre 2003*. This consists of a household survey conducted in 2003 by the Institute of Advanced Social Studies (IESA, 2004), National Research Council (CSIC) in Spain with funding from the Department of Agriculture and Fisheries of the Andalusian Regional Government on a representative sample of 3,192 individual respondents². The target population is all people living in Andalusia aged 18 and over, and the survey is designed to capture individuals' opinions on rural

² The sample is drawn using a stratified, multi-stage design using probability sampling. The principal stratification of the sample takes place by socio-economic groups within census units. Census units were randomly selected ensuring representation of those individuals aged 18 and above. Households were selected within census units accounting for a gender and age quota. To avoid under-representation of densely populated households, results were weighted according to the 2001 National Census.

and agriculture related issues. From this data a sample was drawn of 2,536 questionnaire respondents that provided complete information on the variables used in this study. In the survey, individuals are first asked how important they consider each function or attribute of agriculture, ranging from 1 («not important at all») to 5 («extremely important»). The answer to this question will provide information on the level of concern with each attribute considered (stated individual's preferences for agricultural multifunctionality). Later on, individuals are asked how well they feel agriculture has performed in each of the different attributes that comprise the agricultural multifunctionality concept, ranging from 1 («very badly») to 5 («very well»). This latter question will allow for the study of individuals' opinions proposed for this study.

As already mentioned, the concept of multifunctional agriculture used in this research is based on that provided by the OECD, which reflects both the capacity of agriculture to produce a wide range of goods and services (private and public goods and services) and the existence of a social demand for them (OECD, 2001a). Therefore, up to five different attributes were identified, namely: 1) food production (concern on quantity); 2) food production (concern on quality); 3) non-food agriculture production (textile, flowers, etc.); 4) environmental protection; and 5) employment generation.

The ordered probit model

The analysis now begins with the measurement of individuals' opinions on agricultural multifunctionality performance. Although the *objective* individual's opinion on multifunctional agriculture (OP_i) that a particular agent has reached under his/her surveyed conditions cannot be observed, it can however be measured his/her *subjective* perception on such a performance (SP_i), captured in the response to the question: «How well you feel the agriculture sector has performed in each of the different attributes of multifunctional agriculture?». As already mentioned, evidence shows how individuals' answers to subjective questions are meaningful and interpersonally comparable. Thus, subjective questions can be used to study, what are the factors that determine a given opinion providing interesting and plausible results.

Furthermore, ordinal comparability is assumed implying that individuals share a common opinion of the definition of multifunctionality. This assumption relies on supporting evidence from two psychological findings. The first is that individuals are somewhat able to recognise and predict the satisfaction level of others. In interviews in which respondents are shown pictures or videos of other individuals, respondents were somewhat accurate in identifying whether the individual shown to them was happy, sad, jealous, etc. (Sandvik *et al.*, 1993; Diener and Lucas, 1999). This also held when individuals were asked to predict the evaluations of individuals from other cultural communities. Hence, it is arguable that there is a common human «language» of satisfaction and that satisfaction is roughly observable and comparable among individuals. The second finding is that individuals in the same language community have a common understanding of how to translate internal feelings into a number scale, simply in order for individuals to be able to communicate with each other. Respondents have been found to translate verbal labels, such as «very good» and «very bad», into roughly the same numerical values (Van Praag, 1991). The empirical analysis under the ordinal comparability assumption makes use of latent variable models, such as ordered probit (Greene, 1990)³. The real axis is divided in intervals $(-\infty, \mu_1), \dots, (\mu_5, \infty)$, such that the unobserved variable $OP_i \in (\mu_k, \mu_{k+1})$ if $SP_i = k$. Separate models were estimated for all 5 attributes of multifunctional agriculture using ordered probit regressions, assuming that all explanatory variables potentially have an effect on each attribute.

The empirical analysis aims at testing for the effect of demographic and socio-economic characteristics, identified typologies of individuals (preference groups) along with other regional differences on individuals' opinion on multifunctional agriculture such that,

$$OP_i = \alpha_1(X_{se_i}) + \alpha_2(X_{pg_i}) + \alpha_3(X_{reg_i}) + \varepsilon_i \quad [1]$$

where X_{se_i} is the vector of demographic and socio-economic characteristics; while X_{pg_i} contains the different typologies of preference groups identified and X_{reg_i} refers to vector of other regional variables.

The decision on which variables to include is ultimately based on exploratory analysis and data availability. Table 1 reports the definition of the specific variables used for this research.

³ Linear dependence between the latent variable OP_i and the set of independent variables (x_i), β and ε_i , and that $\varepsilon \approx N(0,1)$ is further assumed.

Table 1. Definition of used variables

Variable	Description
<i>Dependent variables</i>	
SP ₁	= individuals' subjective opinion on the performance of the <i>attribute 1</i> (i.e. <i>food production – concern on quantity</i>) of the concept of multifunctional agriculture used.
SP ₂	= individuals' subjective opinion on the performance of the <i>attribute 2</i> (i.e. <i>food production – concern on quality</i>) of the concept of multifunctional agriculture used.
SP ₃	= individuals' subjective opinion on the performance of the <i>attribute 3</i> (i.e. <i>non-food agriculture production</i> —textile, flowers, etc.—) of the concept of multifunctional agriculture used.
SP ₄	= individuals' subjective opinion on the performance of the <i>attribute 4</i> (i.e. <i>environmental protection</i>) of the concept of multifunctional agriculture used.
SP ₅	= individuals' subjective opinion on the performance of the <i>attribute 5</i> (i.e. <i>employment generation</i>) of the concept of multifunctional agriculture used.
	Variables SP _i are measured asking individuals how well they feel agriculture has performed in such a function where 1 denotes «very badly» and 5 denotes «very well».
<i>Regional variables</i>	
REGION	This variable combines the 8 provinces of Andalusia, namely: Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Sevilla, with type of habitat which is coded into 2 categories: 1. Rural ($\leq 5,000$ inhabitants) and; 2. Non-rural ($> 5,000$ inhabitants). It results in 16 different variables.
<i>Identified typologies of individuals (preference groups)</i>	
CLUSTER	This is a variable specifically created for this paper using factor analysis to identify the relative importance individuals give to the various agriculture attributes and further creating homogeneous groups (clusters) based on those attributes regarded as being relevant to each group. It is coded into 4 categories labelled as follows: 1. Job creation; 2. Production of private goods; 3. Public goods and the new agriculture; and 4. Public goods and the conventional agriculture.
<i>Objective personal variables</i>	
AGE	= age of respondent at date of interview. It further includes age squared.
SEX	= 1, if gender is female; 0, otherwise.
<i>Household composition variables</i>	
PRESENCE OF CHILDREN	This variable is coded into 2 categories: 1, living children even if they are already adults; 0, otherwise.
<i>Socio-economic variables</i>	
EDUCATION	This variable is coded into 4 categories: 1, no schooling; 2, primary studies; 3, secondary studies; and 4, university level.
HEAD OF HOUSEHOLD IN AGRICULTURE	This variable is coded into 2 categories: 1, if the head of the household works in the agriculture sector; and 0, otherwise.
POLITICAL ADSCRIPTION	Political adscription coded into 4 categories: 1, left oriented; 2, centered oriented; 3, right oriented; 4, no political adscription declared.

Definition of regressors and hypotheses

When searching for determinants of individual's opinion on agricultural multifunctionality, regional differences arise as straightforward candidates. *Place of residence* has an influence on the opinions of individuals such that, for example, the further people live

from an urban area, the more they are aware of the environmental status of rural areas and landscapes (Boulanger *et al.*, 2004). Dummy variables indicating place of residence have been introduced in the analysis in an attempt to bring further light about the effect of residency on individuals' opinion on multifunctional agriculture.

However, in addition to «concentric differences» (distances between city-center and periphery); other characteristics could also explain a large portion of individual's variance on their opinion about the achievement of agricultural multifunctionality, specifically, their initial expectations of multifunctionality. As mentioned earlier in the paper, it is expected that conservationists will be more concerned with environmental protection while consumers may focus more on food production. Each group has specific claims for agriculture that will later influence their opinion on the degree of achievement of agricultural multifunctionality. Thus, to further control for individuals' perception of the multifunctionality concept, several types of individuals regarding their expectations of agriculture were identified in the sample (hereafter *preference groups*). These groups of individuals that reflect the society's concern were later included in the regression as categorical variables. This preliminary analysis was undertaken running factor and cluster analysis (detailed information on the methodology followed can be obtained from the authors upon request) resulting in four different preference groups. The largest preference group (cluster 2 containing 69.1% of the sample) seems by far the most concerned on *private goods production*, followed in size by a second one (cluster 1 containing 17.3% of the sample) which is more focused on the social role of agriculture in terms of *job creation*. Lastly, there are two other preference groups that show clear awareness of the multifunctional role of agriculture as they strongly value alternative attributes to basic food and non-food production. They have been named *public goods and the new agriculture* (7.2% of the sample) and *public goods and the conventional agriculture* (6.5%) respectively, as the former shows little interest on the relative importance of the conventional role of food production (quantity) while the latter is less concerned with the relative importance of non-food agriculture production.

Finally, individuals' opinion regarding the performance of agricultural sector may also be dependent upon a number of *demographic and socio-economic characteristics*. Thus, individual's age and gender are likely to affect individuals' opinion. Further, the presence of family responsibilities is also likely to increase the individuals' awareness towards multifunctionality if understood as a sustainability approach as individuals become more altruistic (Andreoni, 1989, 1990) and look for a better situation for their children in the future.

Moreover, as incomes rise, multifunctional attributes are expected to be increasingly valued, assuming that they are «normal» or even «luxury» goods and services from an economic point of view. That is, the income elasticity for multifunctional attributes would be higher than that of traditional food and fiber. This would be translated into a negative relationship between income and values of satisfaction about the performance of agriculture. Given the lack of an appropriate income variable (many respondents refuse answering this kind of questions), this socio-economic characteristic is represented with dummies for education attainment. Potentially, education will shape the preferences of an individual taking into account social aspirations and a valuation of household earned income.

Other socio-economic variables include *political adscription* which is likely to capture certain individuals' claims towards agriculture collected in the bundle of objectives established in the political program, and whether or not the head of the household works in agriculture to test if «first-hand» and better informed knowledge of the situation (as perceived by a farmer) significantly differs «ordinary» citizens.

Results

Descriptive statistics

Before going any deeper into the analysis, Table 2 reports some descriptive empirical results on individuals' opinions on the different attributes of Andalusian agricultural multifunctionality (rows 1 to 5). Average values range between 3.96 and 3.12, explaining performance perceptions between «well» (4) and «not well/not badly» (3). Individuals think agriculture is performing the best in terms of food production (concern on quality), followed by food production (concern on quantity), with non-food agriculture production and environmental protection ranked third and fourth respectively, to end up with employment as the attribute less highly valued. In this sense, there seems to be a contradiction as agricultural unemployment in Andalusia is three times higher than EU-15 average (11.3% regional vs. 4.2% UE-15; CAP, 2004), and agriculture jobs are taken by immigrants, as local people sometimes refuse to work in agriculture. This result may have an explanation on the way the land has historically been organized in Andalusia (i.e. very large and extensively used farms called «*latifundios*»), which has provoked a perception

Table 2. Descriptive statistics of used variables

Variable	Sample mean	Standard errors
<i>Dependent variables</i>		
SP ₁ (Food production —concern on quantity—)	3.90	0.78
SP ₂ (Food production —concern on quality—)	3.96	0.80
SP ₃ (Non-food agriculture production)	3.59	0.91
SP ₄ (Environmental protection)	3.41	0.95
SP ₅ (Employment generation)	3.12	1.10
<i>Regional variables</i>		
REGION (province*habitat):		
— Almería Rural	0.0369	0.011
— Almería Urban	0.0312	0.010
— Cádiz Rural	0.0584	0.012
— Cádiz Urban	0.0989	0.015
— Córdoba Rural	0.0460	0.011
— Córdoba Urban	0.0495	0.011
— Granada Rural	0.0621	0.012
— Granada Urban	0.0343	0.009
— Jaén Rural	0.0635	0.014
— Jaén Urban	0.0358	0.009
— Huelva Rural	0.0544	0.012
— Huelva Urban	0.0198	0.007
— Sevilla Rural	0.1128	0.018
— Sevilla Urban	0.1499	0.018
— Málaga Rural	0.0591	0.012
— Málaga Urban	0.0866	0.013
<i>Identified typologies of individuals (preference groups)</i>		
CLUSTER:		
— Job creation (cluster 1)	0.1737	0.010
— Private good production (cluster 2)	0.6911	0.013
— Public goods and the new agriculture (cluster 3)	0.0723	0.007
— Public goods and the conventional agriculture (cluster 4)	0.0652	0.007
<i>Objective personal variables</i>		
AGE	44.06	0.270
SEX:		
— Male	0.517	0.007
— Female	0.483	0.007
<i>Household composition variables</i>		
PRESENCE OF CHILDREN	0.5478	0.009
<i>Socio-economic variables</i>		
EDUCATION:		
— No studies	0.2346	0.009
— Primary	0.3463	0.010
— Secondary	0.2768	0.009
— University	0.1416	0.008
HEAD OF HOUSEHOLD IN AGRICULTURE	0.0399	0.005
POLITICAL ADSCRIPTION:		
— Left	0.1985	0.009
— Centered	0.3844	0.013
— Right	0.0687	0.006
— No political adscription	0.3481	0.013

Note: Sample size = 2,536.

of lack of employment. Despite the land restructuring undergone along the last decade, this perception still remains on the people's mind.

Table 2 also reports the means and standard errors of all the explanatory variables used in the regressions.

Models results

The next stage of the analysis examines the factors that affect individuals' opinions on different attributes of agricultural multifunctionality following equation [1].

While Table 2 (rows 1 to 5) illustrates the average opinion of all individuals on multifunctional agriculture, it implicitly assumes that all individuals are identical. In fact, people can be extremely heterogeneous and aspects such as place of residence, overall preferences regarding agricultural multifunctionality and demographic and socio-economic characteristics can significantly influence their opinions in different manners as shown next.

Separate models were estimated for all five multifunctional agriculture attributes using ordered probit regressions. Results are presented in Table 3. A positive sign on the statistically significant parameter estimates indicates the likelihood of the response

increasing with 1 unit increase or the presence of the regressor, holding other variables constant (*ceteris paribus*), and vice-versa.

Mainly logical relations appear, but also some remarkable ones come to light. As expected, individuals' opinion on multifunctional agriculture have a strong local influence as *place of residence* significantly affects individuals' opinion on multifunctional agriculture. Thus, people from Almería (both rural and urban), which happen to be a heavy agricultural production area (greenhouses), and rural Jaén also characterized by large olive groves, have a significantly better opinion of the quantity of food produced role of agriculture (*attribute 1*) than urban people from Sevilla (the capital region). They feel, because of their proximity to a highly productive agricultural area, Andalusian agriculture is doing significantly well in terms of producing large quantities of food. However, when it comes to valuing quality of food production (*attribute 2*) individuals from urban Almería think agriculture is performing significantly worse than their Sevillian counterparts. It may be that, despite the quantity, people from urban Almería are more sensitive to the quality of the food produced expressing their discontent with local product quality (e.g. lack of flavour and aroma as a result of highly intensive production systems which use large amounts

Table 3. Estimates of the ordered probit models postulated to explain individuals' opinion on different attributes of multifunctional agriculture. Estimated coefficients are tested using t-test statistics

Explanatory variables	Dependent variables				
	Food production (concern on quantity)	Food production (concern on quality)	Non-food agriculture production	Environmental protection	Employment generation
<i>Regional variables</i>					
REGION (province*habitat)					
— Almería Rural	0.5994**	0.0603	−0.5775**	0.2864	0.8828***
— Almería Urban	0.3735**	−0.6182***	−0.9128***	−0.0501	1.5573***
— Cádiz Rural	−0.0414	−0.0262	0.0831	0.3608**	0.3359*
— Cádiz Urban	−0.0619	−0.0099	−0.1100	0.2314*	0.1318
— Córdoba Rural	−0.0474	0.0487	−0.2181	0.1224	0.1150
— Córdoba Urban	0.3065	0.1935	−0.0594	0.3045	0.3542
— Granada Rural	0.2006	0.2297	−0.4632**	0.4109**	0.2019
— Granada Urban	0.2757	0.1446	−0.3453	0.1755	0.3398*
— Jaén Rural	0.4547***	0.269*	0.3494**	0.6236***	0.6297***
— Jaén Urban	0.3259	0.2639	0.4590**	0.6862***	0.9669***
— Huelva Rural	0.5061*	−0.1869	−0.2247	−0.1633	0.7317***
— Huelva Urban	0.2360	−0.0405	−0.1439	0.1757	0.5367
— Sevilla Rural	0.0848	0.30725*	0.0546	0.0863	0.1768
— Málaga Rural	0.2042	0.7882***	−0.5110**	0.4045*	0.2081
— Málaga Urban	0.3051*	0.6941***	−0.3883**	0.3190**	0.5563***

Table 3 (cont.). Estimates of the ordered probit models postulated to explain individuals' opinion on different attributes of multifunctional agriculture

Explanatory variables	Dependent variables				
	Food production (concern on quantity)	Food production (concern on quality)	Non-food agriculture production	Environmental protection	Employment generation
<i>Identified typologies of individuals (preference groups)</i>					
CLUSTER:					
— Job creation	-0.1390*	0.0731	-0.1866**	-0.1135	-0.1314*
— Public goods and new agriculture	-0.2305*	-0.0846	-0.0819	-0.1237	-0.0734
— Public goods and conventional agriculture	-0.0321	-0.0548	-0.4887***	-0.0338	0.0308
<i>Objective personal variables</i>					
AGE:					
— Age	-0.0027	-0.0224**	-0.101	-0.0219**	-0.0075
— Age squared	0.0004	0.0002**	0.0001	0.00025**	0.0001
SEX:					
— Male	0.0099	-0.026	0.0154	0.0621	0.0267
<i>Household composition variables</i>					
PRESENCE OF CHILDREN	-0.0493	0.0349	-0.0979	0.0253	-0.0784
<i>Socio-economic variables</i>					
EDUCATION					
— Primary	0.0452	0.0654	0.0676	0.0077	-0.0435
— Secondary	0.2023*	0.0481	0.1231	-0.1184	-0.0663
— University	0.0176	-0.0755	-0.0458	-0.3292***	-0.1961*
HEAD OF HOUSEHOLD IN AGRICULTURE	0.0223	0.0760	0.0722	0.1361	0.1212
POLITICAL ADSCRIPTION					
— Left	-0.0638	-0.0442	-0.0742	-0.0518	-0.1138
— Right	0.0454	0.0522	-0.0338	0.2152*	0.1193
— No political adscription declared	-0.0025	0.0838	-0.0438	-0.0024	-0.0690
$\hat{\gamma}_1$	-2.461***	-2.7922***	-2.6379***	-2.2248***	-1.5268***
$\hat{\gamma}_2$	-1.226***	-1.6972***	-1.392***	-1.0999***	-0.4218
$\hat{\gamma}_3$	-0.789**	-1.1335***	-0.8413***	-0.3523	0.2170
$\hat{\gamma}_4$	1.159***	0.6546**	1.0338***	1.2400***	1.5198***
Sample size (N)	2,356				
Log pseudo-likelihood	-2,361.78	-2,478.30	-2,660.46	-2,961.68	-3,265.68
Pseudo-R ²	0.0198	0.0353	0.0437	0.0273	0.0403

Omitted categories: POLITICAL ADSCRIPTION = centered. EDUCATION = no studies. CLUSTER = private goods production and REGION = Sevilla urban. * < 0.05; ** < 0.01; *** < 0.001.

of chemical products; presence of pesticides in food, etc.). Regarding the evaluation of the quality of food production, people from Málaga (rural and urban), rural Jaén and Sevilla have a significantly better opi-

nion than the capital dwellers. As opposed to their Almerian counterparts, these individuals enjoy very traditional agriculture systems (extensive olive groves and cereal) which are likely to have much better quality.

The attribute related to non-food agricultural production (*attribute 3*) also show some interesting results. People from rural Granada are significantly more disappointed than capital dwellers with how agriculture is performing on non-food production (maybe due to the recent cut-offs in the production of tobacco), and the same happens to Almería and Málaga dwellers (noticed that farms devoted to flowers and ornamental plants productions had to be reconverted here) while people from Jaén are significantly happier, maybe due to the successful cotton production, at least until the 2004 Cotton Reform approved by the EU.

Individuals from Málaga, Jaén, rural Granada and Cádiz all have a significantly better opinion than urban Sevillians on the multifunctional role of environmental protection (*attribute 4*). Again, these areas enjoy tradition extensive agricultural systems (olive groves, vineyards and extensive animal farming systems called «dehesas») which are more eco-friendly and generate more positive than negative environmental externalities.

Lastly, individuals from Almería and Jaén, rural Huelva and urban Málaga have a significantly better opinion of the job creation role (*attribute 5*) than their urban Sevillian counterparts. These areas have labour intensive crop production (vegetables in greenhouses, olives and fruits —strawberries or oranges—). This comes back to the beginning of this discussion on multifunctionality attributes as these same individuals also value positively the role of food production (quantity). It seems these individuals consider job creation intrinsically joined to food production (quantity) and they are happy to see this occurrence taking place in their areas.

Summarizing, there is a strong contextual interpretation, which certainly helps to shape quite a clear geographical picture of individuals' opinion on multifunctionality in Andalusia.

The research focuses now on the effect that different *preference groups* —with different claims, concerns and expectations—, may have on individuals' opinion towards the performance of the agricultural multifunctionality. The reference group is the largest one, which is mostly concerned on the *production of private goods*. Thus, the *job creation* group (the most socially concerned one) still has a slightly significant worse opinion on the employment attribute than the reference one (*ceteris paribus*). They also value the performance of the non-food agriculture production attribute and food production (quantity) worse than the reference group. This group seems to believe that increasing agricultural production (food and non-food) necessarily

will bring greater employment. This would be the argument of someone who perceives Andalusian agriculture as *latifundist* (large extensive farms) and poor in job creation.

Furthermore, the *public goods and new agriculture* group which value below average the relative importance of food production (quantity) has a significantly lower opinion of the performance of agriculture for this specific attribute. The complaint here is that less should be done here, taking into account that it is not a priority for them. A similar interpretation could be given to the results for the *public goods and conventional agriculture* group, which value the importance of non-food production below the average and also have a bad opinion on how this function is performed.

As expected, overall results show that, after controlling for personal and regional characteristics, preference groups still have a say in the evaluation of agricultural multifunctionality performance. Their opinions on agriculture performance from a multifunctional point of view are consistent with their preferences (relative importance of attributes) and they feel as if their claims have not yet been successfully satisfied. Knowing their size and direction of claims can be of tremendous importance in providing a customized, better response to their demands.

Finally, once regional and preference variables are taken into account, much of the *demographic and socio-economic variables* loose their significance. The relationship between age and individuals' opinions on multifunctional agriculture turns out to be u-shaped only for quality food production (attribute 2) and environmental protection (attribute 4) reaching minimal opinion with the performance on that specific attribute at approximately 41 and 43 years of age respectively. No significant differences on the evaluation of agriculture performance (*ceteris paribus*) have been found by gender, by political adscription or depending on the presence of children in the household. Surprisingly, the fact that the head of the household is in agriculture does not seem to have a significantly different effect on individuals' opinion of agricultural multifunctionality, suggesting that the awareness of the multifunctionality concept seems to equally affect all individuals without significant distinction found by the closeness to agriculture. Regarding the impact of education, the coefficient estimates on university degree were negative and significant in the attributes «environmental protection» and «employment» (more significant for environmental protection). This suggests that

university graduates (correlated with individuals with higher incomes) as opposed to individuals with no studies are significantly less content with the way agriculture has performed in relation to environmental protection and employment, maybe because they have greater expectations and demands of public goods from agriculture.

Discussion

This paper aimed to contribute further research on the conceptualization of agricultural multifunctionality through quantitative methods. Based on a large dataset and using selfreported measure of individuals' opinions on multifunctionality, ordered probit models are used to analyze the extent to which individuals' perceptions of multifunctionality can be explained not only by individual and regional characteristics, but more importantly, by the preferences individuals have for a given type of agriculture.

The empirical analysis was conducted on the opinion Andalusian citizens have about agricultural multifunctionality, taking into account its multi-attribute feature. Using data from the 2003 *Agrobarometre*, this study explored the effect of regional characteristics on their overall assessment of the multidimensional nature of agriculture, after accounting for personal characteristics. Given their stated preference for a type of agricultural multifunctionality, the proposed method highlights those attributes of the concept which do not fully satisfy individuals' expectations.

Results indicate that individuals in Andalusia are aware of the multi-dimensional nature of agriculture as a provider of private and public goods and services; although a big fraction of the Andalusian population (69.1% of the sample) still focuses its demand on private goods production. The identification of individuals more concerned on public goods production provides an efficient tool to target individuals whose expectations are not fully satisfied. This is possible since it is the nonmarket nature of the «new multifunctional agriculture» that poses the biggest policy challenge. These results can help to communicate the non-market demand to policy-makers.

The study further shows, above all, that there is a strong contextual/regional interpretation on how citizens perceive the multifunctionality of agriculture. In fact, it can be concluded that individuals express their levels of satisfaction/dissatisfaction depending on their subjective perception of the surrounding agricultural systems. Not surprisingly, for the general public, the

term «agricultural sector» seems equivalent to the closest farming activities.

Some socio-economic variables also shape individuals' perceptions of multifunctionality attributes. Thus, there seems to be some spill over on the awareness of agricultural multifunctionality attributes beyond farmers, as being a farmer and head of the household does not significantly differ from other roles and activities. Besides, individuals with a greater level of education and income have a more negative perception of the way the environmental protection and employment attributes are implemented in the agriculture.

On the whole, this research proves to be a valuable quantitative tool to identify individuals' satisfaction with agricultural multifunctionality. The method can certainly help policy-makers to provide a customized, better response to social demands on this matter.

In this sense, it is important to remark the practical implications of the present study for the design and implementation of agricultural policy. The results on individuals' opinion on agricultural multifunctionality will enable improvements in policy decision making so as to optimize the *perceived* social welfare of citizens. This can be done in a twofold way. First, when the performance of the agricultural sector is considered disappointing, according to actual data (technical objective information), there is room for policy instrument design. The new orientation of the Common Agricultural Policy (CAP) can be considered in this sense as a good example, aiming to promote a net increase in social welfare by the introduction of decoupled payments conditional on compliance with a range of environmental, food safety, animal and plant health and animal welfare standards. Second, when social dissatisfaction regarding the agricultural sector is based on a biased individual's perception (disagreeing technical objective information), as is the case of employment generation in the Andalusian case under study, other different measures should be put in place so as to «correct» the wrong public perception of this sector (i.e. public campaign informing society with actual data).

In any case, it should also be highlighted the strong regional component of individuals' opinion on agriculture multifunctionality. These results support some of the measures put in place since the late 90s by the CAP allowing for a greater degree of flexibility to regional/local governments on the development and application of this common policy (national envelopes, etc.). In fact, a further degree of CAP subsidiary would be recommended in this sense, since regional/local go-

vernments seem the most suitable agents to better identify individuals' satisfactions/dissatisfactions.

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